CITIZEN

User’s Manual

MINI DOT MATRIX PRINTER

MODEL **CBM-910**

Japan CBM Corporation
Information Systems Div.

1995.09.04(10-DCL)7

Declaration of Conformity

Manufacturer's Name :	: Japan CBM Corporation
Manufacturer's Address	: 1-1-7, Okubo, Shinjuku-ku, Tokyo 169, Japan

Declare the Product

Product Name	Dot Matrix Printer
Model Number (s)	CBM-910 Series (CBM-910R, CBM-910P) (S.NO.95X0001 -)

Conform to the following Standards

LVD	: EN60950	:1992+A1+A2:1993
EMC	: EN55022	:1994 Class B
	: EN60555-2	:1987
	: EN50082-1	:1992
	: IEC801-2	:1991 4KV CD, 8KV AD
	: IEC801-3	:1984 3V/m, 27MHz-500MHz
	: IEC801-4	:1988 0.5KV Signal Line 1KV AC mains

Supplementary Information
"The product complies with the requirements of the Low Voltage Directive 73/23/EEC, 93/68/EEC and the EMC Directive 89/336EEC, 92/31/EEC, 93/68EEC"

Place Tokyo, Japan

Date Sept.1995

Signature

Full Name : Koji Tanabe
Position : General Manager
R & D Department

Europe Contact :
Europe Liaison Office
Kuruisweg 805, Holland Office Center Building
3-2132 NG Hoofddorp, the Netherlands

Warning
This is a Class A products. In a domestic environment this product may cause radio interference
In which case the user may be required to take adequate measures.

This declaration is applied only for 230V model.

IMPORTANT SAFETY INSTRUCTIONS

- Read all of these instructions and save them for later reference.
- Follow all warnings and instructions marked on the product.
- Unplug this product from the wall outlet before cleaning. Do not use liquid or aerosol cleaners. Use a damp cloth for cleaning.
- Do not use this product near water.
- Do not place this product on an unstable cart, stand of table. The product may fall, causing serious damage to the product.
- Slots and openings on the cabinet and the back or bottom are provided for ventilation. To ensure reliable operation of the product and to protect it form overheating, do not block or cover these openings. The openings should never be blocked by placing the product on a bed, sofa, rug of other similar surface. This product should never be placed near or over a radiator or heat register. This product should not be placed in a built-in installation unless proper ventilation is provided.
- This product should be operated from the type of power source indicated on the marking label. If you're not sure of the type of power available, consult your dealer or local power company.
- Do not allow anything to rest on the power cord. Do not locate this product where the cord will be walked on.
- If an extension cord is used with this product, make sure that the total of the ampere ratings on the products plugged into the extension cord do not exceed the extension cord ampere rating. Also, make sure that the total of all products plugged into the wall outlet dose not exceed 15 amperes.
- Never push objects of any kind into this product through cabinet slots as they may touch dangerous voltage points or short out parts that could result in a risk of fire or electric shock. Never spill liquid of any kind on the product.
- Except as explained elsewhere in this manual, don't attempt to service this product yourself. Opening and removing those covers that are marked "Do Not Remove" may expose you to dangerous voltage points or other risks. Refer all servicing on those compartments to service personnel.
- Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
  A. When the power cord or plug is damaged or frayed
  B. If liquid has been spilled into the product.
  C. If the product has been exposed to rain or water.
  D. If the product dose not operate normally when the operating instructions are followed. Adjust only those controls that are covered by the operating instructions since improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to normal operation.
  E. If the product has been dropped the cabinet has been damaged.
  F. If the product exhibits a distinct change in performance, indicating a need for service.

IMPORTANT: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

CAUTION: Use shielded cable for this equipment.

For Uses in Canada
This digital apparatus does not exceed the class A limits for radio noise emissions from digital, apparatus, as set out in the radio interface regulations of the Canadian department of communications.

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1. INTRODUCTION

The CBM-910 is a dot-impact printer widely usable with various data communication terminals and measurement terminals.
This printer, being extremely compact and equipped with extensive functions, is suitable for a wide range of applications.
You are kindly requested to read this manual thoroughly to understand the product prior to actual use.

1.1 Features

1. Compact desk-top dot matrix printer
2. Light weight
3. High speed printing
4. Paper-end detecting function
5. Conformity to RS-232C and Centronics.
6. Low power consumption
7. Low price

1.2 Accessories

The following attachments are included in this set aside from the printer itself. Please confirm.

Paper roll (1 roll)
Ribbon cassette (1unit)
AC adapter (1 unit)
User's manual (1 booklet)

2. TYPE CLASSIFICATIONS

2.1 Type

The product is categorized according to the naming plan indicated below.

CBM-910	24 40	P R	F	120 230	A B

CBM-910 - 24 R F 230 - A

Model Name

Number of columns[*1]
24 : 24 columns/144 dots(MD-910)
40 : 40 columns/180 dots(MD-911)

Interface
P : Parallel(centronics)
R : Serial(RS-232C)

Character
F : International

Adapter
120 : AC 120V
230 : AC 230V

Printer cover
A : 60mm(Dia.) Paper roll
B : 80mm(Dia.) Paper roll

(Note)
*1) No. of digits varies for ROM.

2.2 AC Adapter

Please use the exclusive adapter indicated below.

91AD-U (AC 120V)
91AD-E (AC 230V)

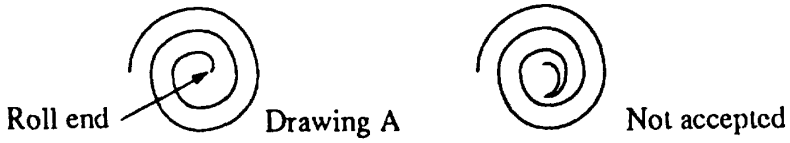
2.3 Specifications

Item		CBM-910-24*	CBM-910-40*
1	Printing method	Dot matrix	
2	Printing direction	One-way printing	
3	Character configuration (W × H)	(5 + 1) × 8	(4 + 0.5) × 8
4	Number of columns per line	24 columns: 144 dot/line	40 columns: 180 dot/line
5	Printing speed	Approx. 2.5 line/sec.	Approx. 1.8 lines/sec.
6	Character size (W × H)	1.62 × 2.4 mm	1.08 × 2.4 mm
7	Line pitch	3.52 mm	
8	Paper	Paper Roll 57.5 ± 0.5(W) × 60 or 80 (Dia) mm Core ID ∅ 12 ± 1 mm Core OD ∅ 18 ± 1mm *1	
9	Interface	Parallel Interface (Conformity to Centronics) or Serial Interface (RS-232C)	
10	Input buffer	2K bytes	
11	Paper-end detection	Printing suspended when printing paper gets scarce.	
12	Ink ribbon	Purple (Private ribbon cassette) Service life: approx. 250,000 letters	
13	Voltage	DC 7V ± 1V (Printing) Use exclusive adapter (DC 7V, 1.6A)	
14	Power consumption	Printing : approx. 7VA Stand-by : approx. 0.5VA	
15	Weight	Approx. 400g	
16	Reliability	MCBF 1 million lines	MCBF 700,000 lines
17	Dimension	106(W) × 180(D) × 88(H) mm	
18	Operating temp.	0°C to 40°C	
19	Storage temp	-20°C to 60°C	

*1. SPECIAL REMARKS CONCERNING PAPER

SHAPE: The roll end(end part of the inside diameter) should satisfy the following (Refer to Drawing A):

1. Free of fold and well aligside diameter
2. Free of flaps
3. Not adhered to core part(if there is one)



RECOMMENDED PAPER:

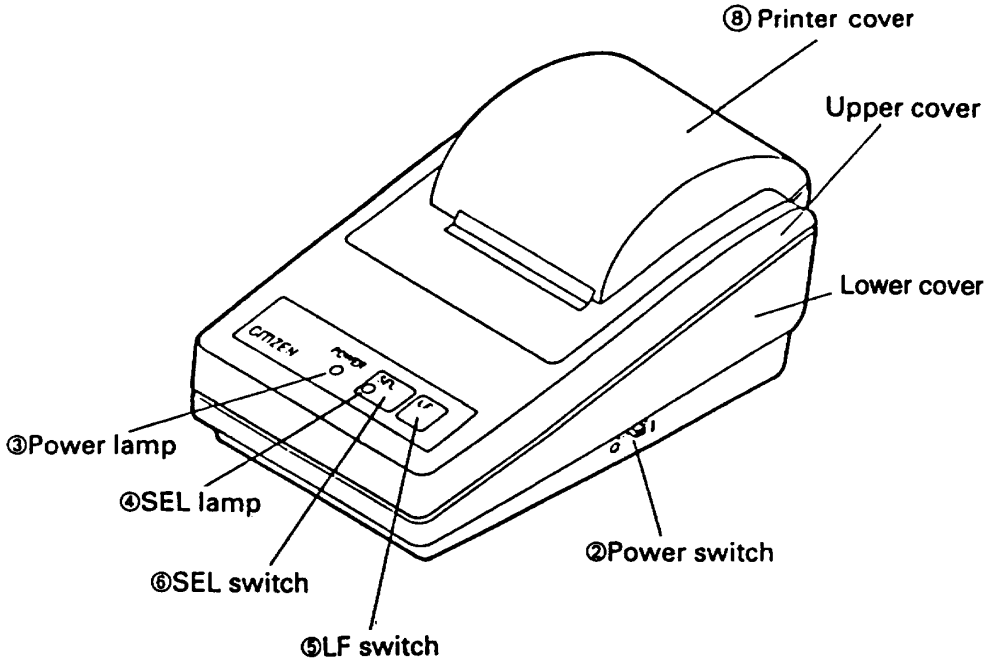
Single paper …….45~55 kg/1,000 sheets/1,092 × 788 mm/1,000 sheets/

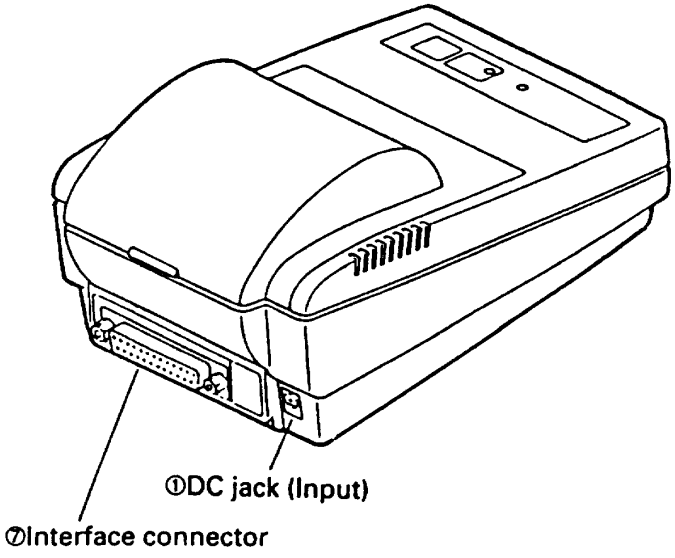
Copy paper……non-carbon paper/original(34 Kg-paper)+copy 1 sheet (34 Kg-paper)

Total thickness……0.13 mm or less

3. EXTERNAL APPEARANCE AND PART DESCRIPTIONS

3.1 External Appearance





3.2 Part Descriptions

1 DC Jack — Insert the output plug of the AC adapter attached

2 Power Switch — When switched ON, power is supplied to the Printer, starting the initializing operation.

3 Power Lamp — Lighted when power is turned ON and goes out when turned OFF.

4 SEL Lamp — Printer lights up in Select (ON LINE) state, and is put off in Deselect (OFF LINE) state. Printing operation is available only while this lamp is lit.

1) It blinks, for paper end, at 0.5 second intervals. Change paper.
2) On occurrence of any alarm state (blinking) due to any reason other than paper end, it starts to blink at 1/4 second intervals.

5 LF Switch — Paper is fed when switch is pressed (de-select condition only). Used to supply paper or to insert some space in the output.

6 SEL Switch — Printer is selected (ON-LINE) by pressing this switch.
Printer is de-selected (OFF-LINE) by pressing the switch again.
Also used to release alarm state. In Deselect state, if data still remain in the input buffer, they are all printed out.

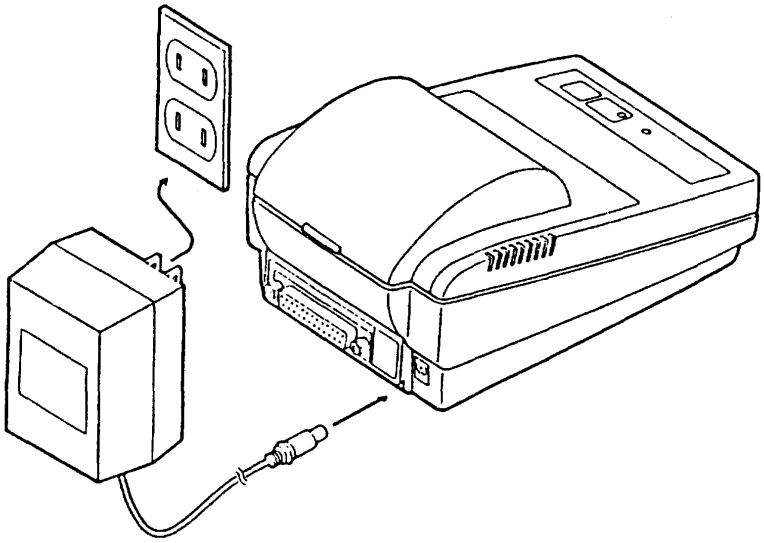
7 Interface Connector — Printer is connected to various hosts via cables. Please ensure that both the printer and the host are turned off before connecting.

8 Printer Cover — Opened to change ribbon cassette and paper roll.

4. OPERATIONS

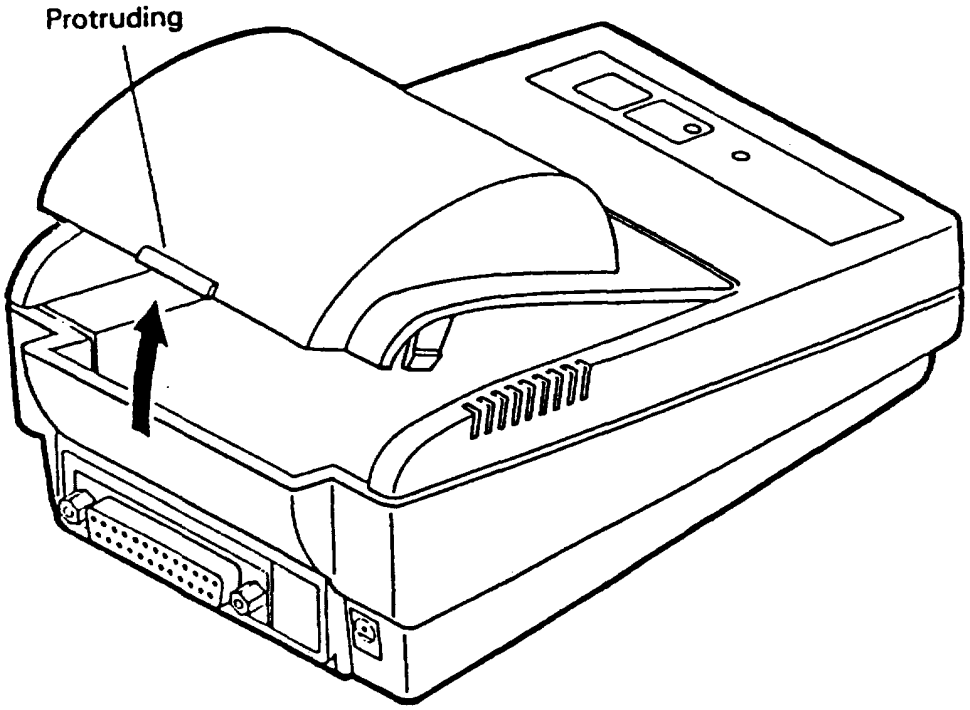
4.2 Connection of the AC adapter

(1) Make sure the power switch is OFF.
(2) Insert the output plug of the AC adapter into the DC jack of the printer.
(3) Insert the power plug of the AC adapter into a power outlet supplying the designated voltage.
(Be sure to use an AC adapter for the power source.)



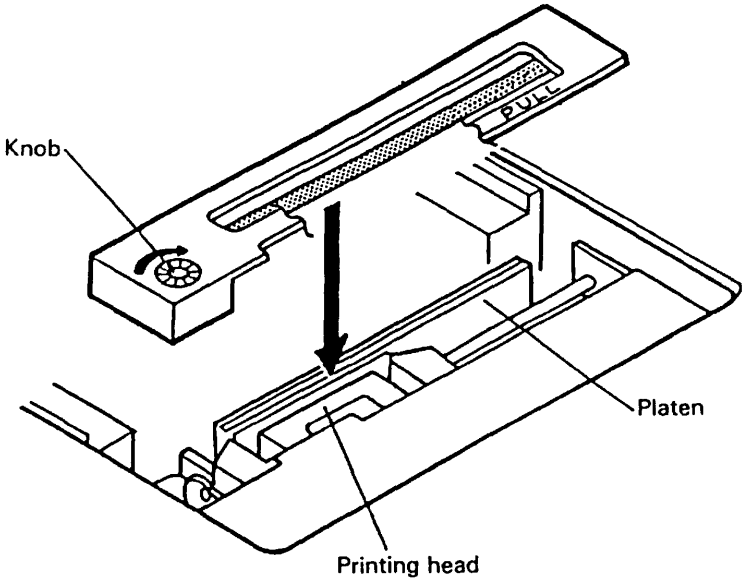
4.2 Inserting the Printer Cover

(1) Hold the protruding section at the rear of the printer cover and lift in the direction indicated.
(2) Attach the cover by pressing downward after hooking the cover into the slots located in the front part.



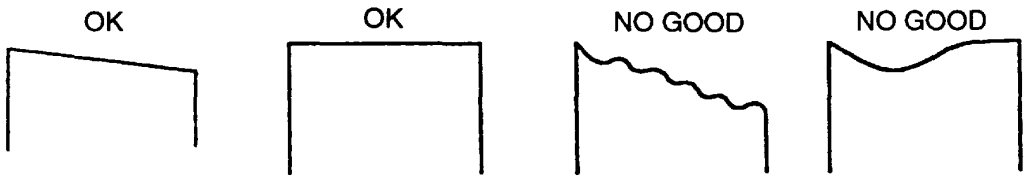
4.3 Inserting Ribbon Cassettes

(1) Turn the printer off and remove the printer cover.
(2) Press down on the Ribbon cassette while inserting the ribbon between the printing head and the platen.
(3) Wind up the ribbon slack by turning the knob in the direction of the arrow.

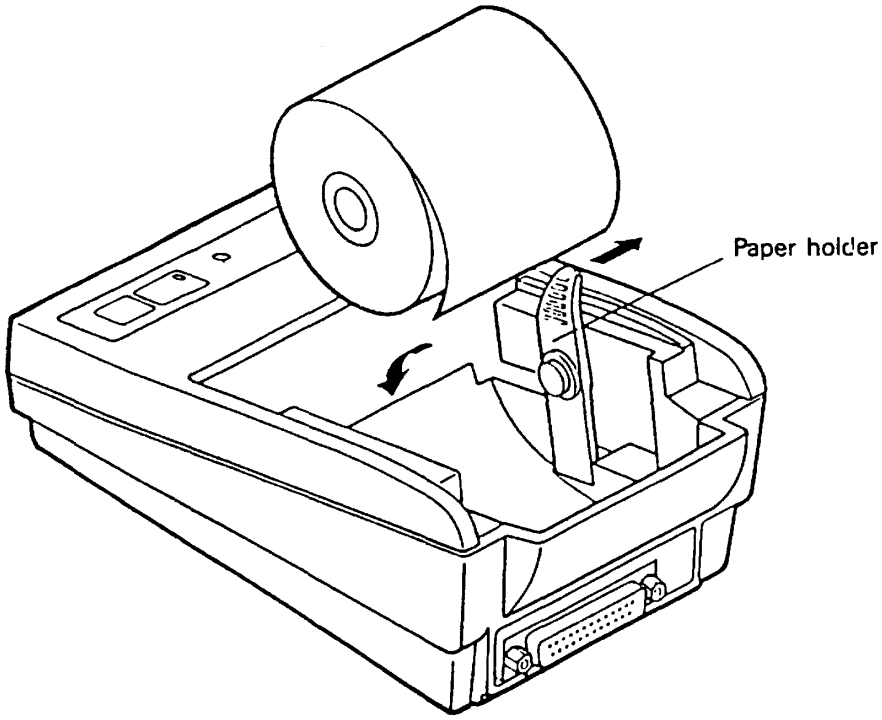


4.4 Inserting Paper

(1) Remove the printer cover.
(2) Ensure that the end of the paper is straight or angled as indicated in the diagram.
(3) Insert paper with the paper holder turned down in the arrow-indicated direction, hold the core.
(4) Insert paper into the slot of the printer mechanism.
(5) After turning on the printer, press the LF switch until 5 to 6 cm of paper is fed out of the printer mechanism.
(6) Then, attach the printer cover so the end of the paper comes out of the opening in the cover.



(NOTE)
Paper, if held aslant at the paper feed or the paper discharge side, may cause paper jamming. On occurrence of the above, immediately cut off power and slowly pull out remaining paper upright.



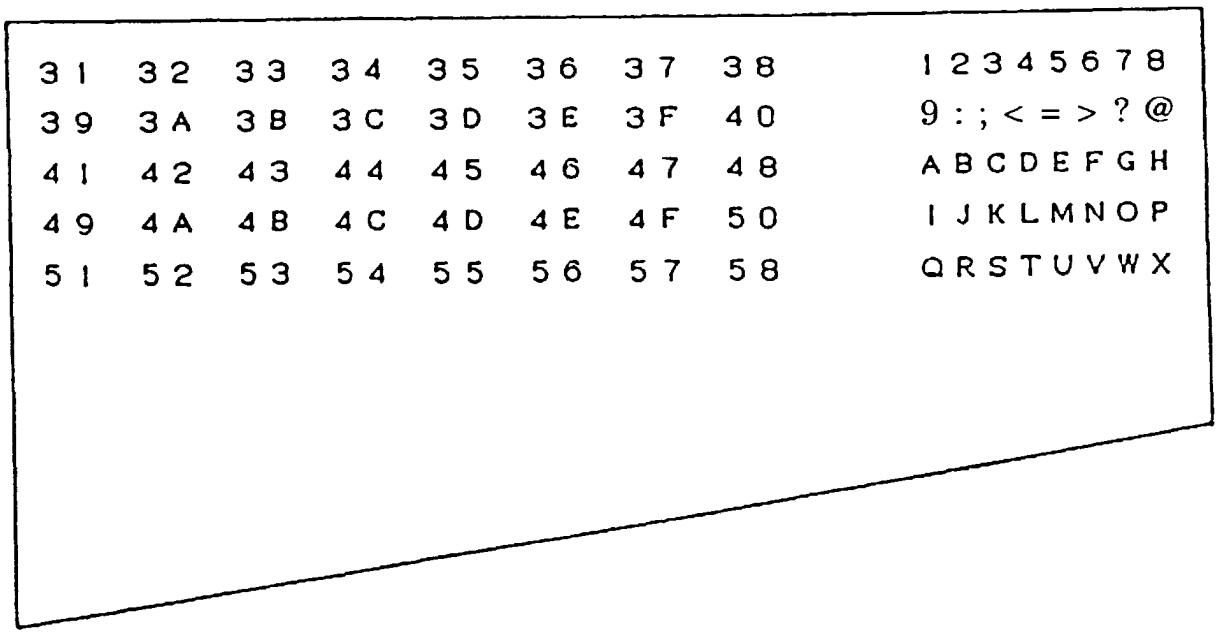
4.5 Self-Printing Function

(1) Test printing
Turn on the power switch while holding the LF switch down.
SEL lamp is held off during this stage, where BUSY signal is output.
On completion of test printing, normal operation is recovered.

(2) Dip switch information printing
When the power is ON and the LF/SEL switch is pressed, the dip switch/communication method (including set details for serial) are printed.
At this point, SEL lamp is held off where BUSY signals are output.
Only with a 40-column type printer, following printing of dip switch information, printing is available in on-line in hexadecimal dump mode.

(3) Hexadecimal dump mode
All data sent from the host computer are printed in hexadecimal codes.
When data for the last line are not sufficient for full one line, data of the last line are printed out with SEL switch being pressed and deselected (OFF LINE).
This mode lasts till power is cut off.

Example of Printing in Dump Mode



4.6 Paper End. Mechanical Alarm

(1) Paper end
Paper shortage is detected and informed with SEL lamp blinking at 0.5 second intervals, where printing is suspended. At this time, power supply to the motor and printing solenoid is stopped with BUSY signals output in the host computer.
To discontinue from Paper End state, insert new paper and press SEL switch twice. LF functions normally.
By pressing SEL switch twice, you can print, without changing paper, data for one-line input buffer on the remaining page.

(2) Mechanical alarm
On occurrence of locked motor, any kind of trouble in the mechanism is suspected. Power supply to the motor and printing solenoid is stopped and BUSY signals are output to the host computer. SEL lamp is then blinked at 1/4 second intervals. To recover from alarm state, eliminate the trouble cause and press SEL switch twice.
If it is in the course of printing, printing is started at the beginning of the interrupted line. (Content of the input buffer is still held.) However, this dose not apply in the case where power has been cut due to a severe trouble.

4.7 General Remarks

(1) Do not print without a ink ribbon properly inserted. This may cause damage on the print head.
(2) Change ink ribbon before it becomes worn-out. Do not supplement ink.
(3) Be careful not to drop, inside the main body, a clip, a setting pin, or any foreign matter. This will lead to machine failure.
(4) Always place your printer on a flat stable table. If it not flat or stable, the main body will be displaced by vibrations while printing, creating possible danger. Holding it steadily is also important to avoid erroneous operation.
(5) Never use organic solvent to clean the surface of the printer main body, (alcohol / thinner / benzine, etc.)
(6) Paper may be damaged if left for long hours with a ribbon cassette inserted . Also, continuous printing, if conducted at a low temperature, may cause thin printing due to ink features.
(7) Ribbon cassette, upon shipment, should not be mounted on a printer

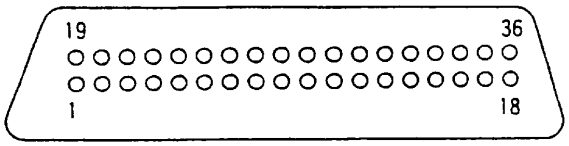
5. PARALLEL INTERFACE

5.1 Specifications

(1) Data input system : 8 bit parallel (DATA 1-8)
(2) Control signal : ACK, STB, BUSY, RESET,
(3) Compatible Connector : Printer side : 57LE-40360 (AMPHENOL or equivalent)
: Cable side : 57-30360 (AMPHENOL or equivalent)

5.2 Connector Pin Assignment

PIN	SIGNAL NAME	PIN	SIGNAL NAME
1	STB	19	TWISTED PAIR GND
2	DATA 1	20	TWISTED PAIR GND
3	DATA 2	21	TWISTED PAIR GND
4	DATA 3	22	TWISTED PAIR GND
5	DATA 4	23	TWISTED PAIR GND
6	DATA 5	24	TWISTED PAIR GND
7	DATA 6	25	TWISTED PAIR GND
8	DATA 7	26	TWISTED PAIR GND
9	DATA 8	27	TWISTED PAIR GND
10	ACK	28	TWISTED PAIR GND
11	BUSY	29	TWISTED PAIR GND
12	GND	30	TWISTED PAIR GND
13	HI-LEVEL	31	RESET
14	GND	32	
15		33	GND
16	GND	34	
17	FRAME GND	35	
18		36	



5.3 Description of Input/ Output Signals

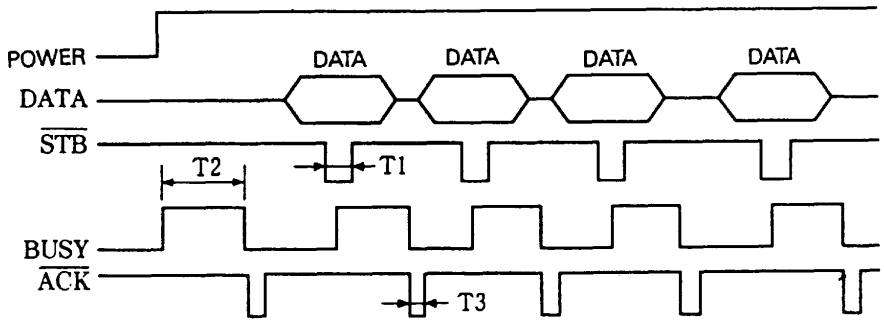
(1) Input signal

- DATA 1……..8 bit parallel signal (positive logic)
- DATA 2……..8 bit parallel signal (positive logic)
- DATA 3……..8 bit parallel signal (positive logic)
- DATA 4……..8 bit parallel signal (positive logic)
- DATA 5……..8 bit parallel signal (positive logic)
- DATA 6……..8 bit parallel signal (positive logic)
- DATA 7……..8 bit parallel signal (positive logic)
- DATA 8……..8 bit parallel signal (positive logic)
- STB……Strobe signal for reading out data (negative logic)
- RESET……..Signal for resetting the entire unit (negative logic)

(2) Output signal

- ACK……..8 bit data signal for requesting data. ACK is issued at the end of the BUSY signal (negative logic)
- BUSY……Signal indicating the printer is busy. Input new data when the signal is in "LOW" condition. (positive logic)
- HI-LEVEL……Connected to Vcc via 3.3 kΩ resistance.

(3) Timing chart



T1 2.7μs MIN
T2 500mS MIN (When power is supplied)
T3 10μs TYP

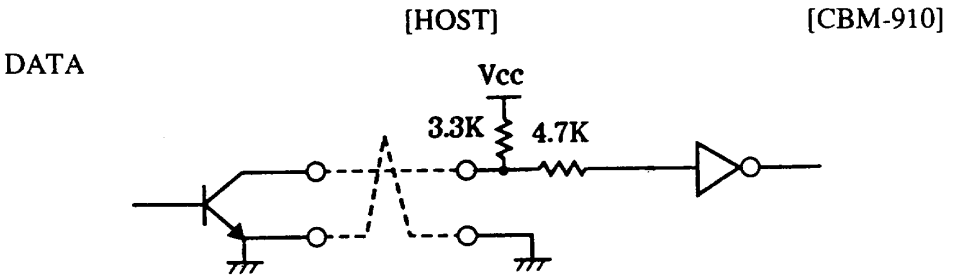
5.4 Electrical Characteristics

(1) Input signal level
RESET signal are at TTL level, while inputs other than this are at HCMOS level.

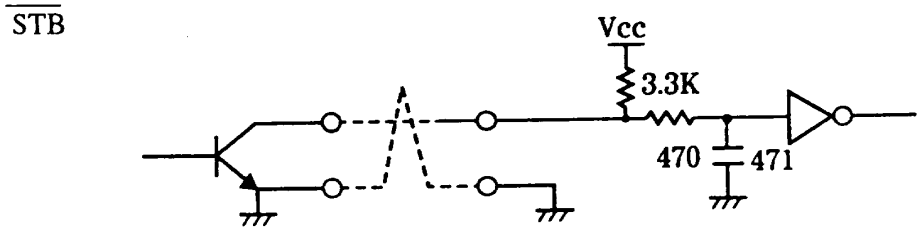
TTL Level	HCMOS Level
"HIGH" level : 2.0V MIN	"HIGH" level : 4.0V MIN
"LOW" level : 0.8V MAX	"LOW" level : 1.0V MAX

(2) Output signal level
Output signal level is held at TTL.
"HIGH" level : 2.4V MIN
"LOW" level : 0.4V MAX

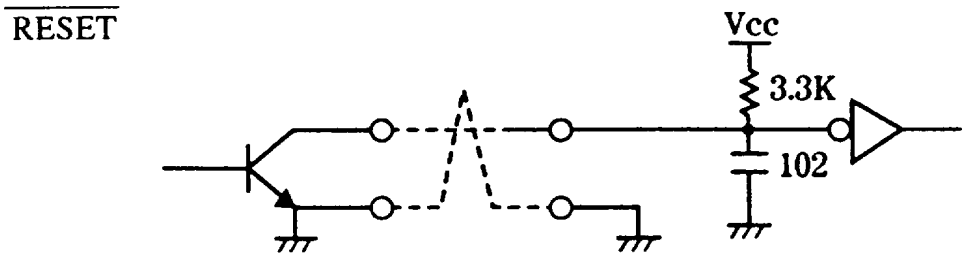
(3) I/O Conditions
INPUT SIGNALS



(HC373 or equivalent)



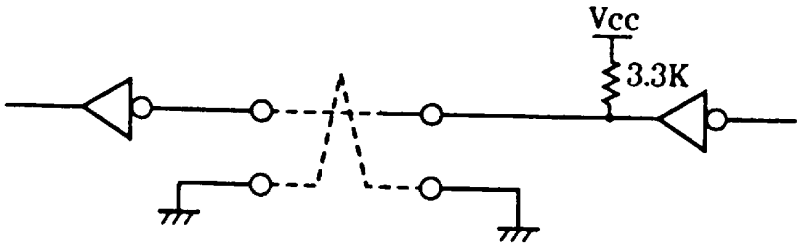
(HC04 or equivalent)



(7407 or equivalent)

OUTPUT SIGNAL

ACK
BUSY



(7407 or equivalent)

6. SERIAL INTERFACE

6.1 Specifications

(1) Synchronization : Asynchronous
(2) Baud rate : 1200, 2400, 4800, 9600 Baud/sec (User selection)
(3) Word configuration
- Start bit : 1 bit
- Data bit : 7 bit or 8 bit (User selection)
- Parity bit : odd, even, no parity (User selection)
- Stop bit : 1 bit or more

(4) Signal polarity

RS-232C
- Mark = Logic"1"(-3 to –12V)
- Space = Logic "0"(+3 to +12V)

TTL (RESET)
- H level = Logic"1"
- L level = Logic"0"

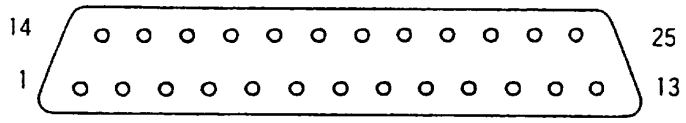
(5) Receive Data (RD)
- Mark : 1
- Space : 0

(7) Transmit Data (TD)
- Mark : 1
- Space : 0

(8) Received control (DTR signal)
- Mark : Data transmission not possible
- Space : Data transmission possible

6.2 Connector Pin Assignment

SIGNAL PIN	SIGNAL NAME	SIGNAL DIRECTION HOST-PRINTER	FUNCTION	RS-232C	TTL
1	FG		Frame ground	•	
7	GND		Signal ground	•	
2	TD	←	Transmit data	•	
3	RD	→	Receive data	•	
20	DTR	←	Printer BUSY signal	•	
23	RESET	→	Printer reset signal		•



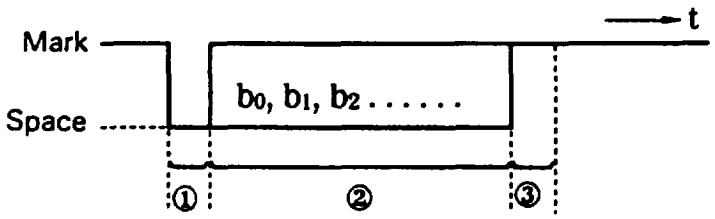
Note: 1. Signals for RS-232C are based on EIA RS-232C level.
Applicable connector (D-sub connector)
Printer side : 17LE-13250 (Anphenol equivalent)
Cable side : 17JE-23250 (Anphenol equivalent)

6.3 Description of Input / Output signal

(1) Input signal

1) TD (TRANSMIT DATA) Serial transmission data signal.
2) RD (RECEIVE DATA)
Serial receive data signal.
3) DTR (DATA TERMINAL READY)
Input command or data while this signal is in ready state. Data input while the signal is BUSY will cause an overrun error to occur. Data can be provided to the input buffer even if the printer is printing. Busy state may also occur when power is applied, or during test printing, on-line, or when the printer is reset.
4) RES ET
Signal resets the entire printer. (More than 4ms.)
5) FG(FRAME GND)
Case ground.
6) GND
Signal ground for the circuit.

(2) Data configuration

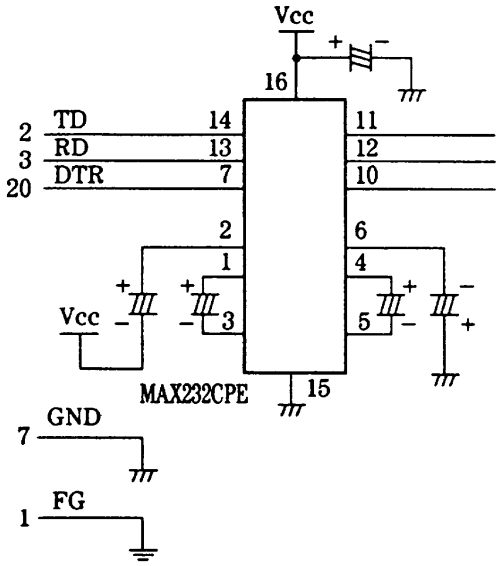


1 Start bit (1 bit)
2 Data bit (7 or 8 bit)
3 Stop bit (more than 1)

6.4 Electrical Characteristics

(1) RS-232C I/O Signals (RD / TD / DTR)

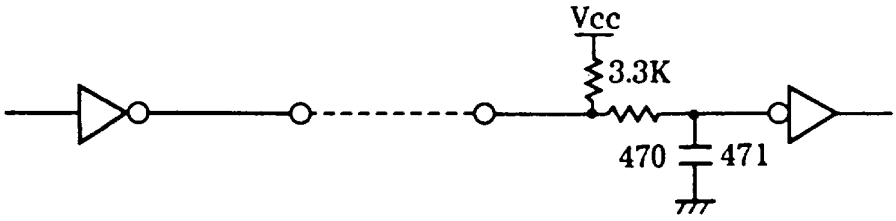
- Input (RD / TD) Mark = (-8V): stop bit
  Space = (+8V): start bit
- Output (DTR) Mark = (-8V): for Busy
  Space = (+8V): for Ready



(2) TTL Circuit

Input (RESET)

[HOST] [CBM-910]



Set to low when reset

[HC04 or equivalent]

6.5 Error Detection

• Communication error

Parity Error
When parity nonconformity heaving been detected out of odd-even parity checking conducted when parity check is assigned.

Framing Error
When space state detected on detection of stop bit.

Overrun Error
When next following data having been transferred to receiving buffer register regardless of presence of data in that receiving buffer register.

On occurrence of the above error, convert data at the time of occurrence into ' ' (7FH) to print it out.

RECEIVING CONTROL AND BUFFERING
The CBM-910 controls, on receipt of print data, receiving (DTR Control) in one-word unit.
If the host disregards DTR and carries out data transmission at this time. over-run of receiving data may be resulted.
This state should be avoided on the host's responsibility. (The data discharging type host cannot follow this.)
This is applicable when the host adopts a double buffer type transmitter.

7. DIP SWITCH SETTING

7.1 Serial Interface Type

Switch No.	Function	OFF	ON	Shipping Setting
1	Character	International	-	OFF
2	CR	CR disregarded	CR + LF	OFF
3	Bit Length	8 bits	7 bits	OFF
4	Parity	Provided	Not provided	ON
5	Conditions	Odd	Even	OFF

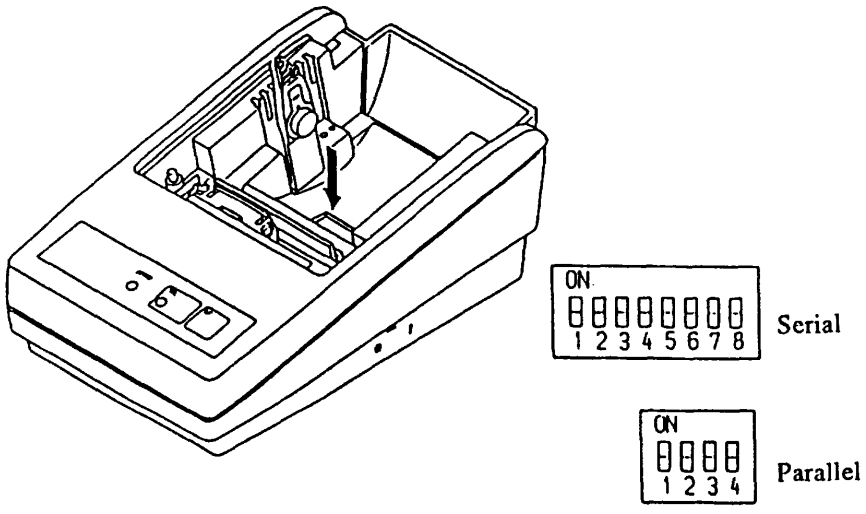
Baud Rate (bps) Selection

Switch No.	1200	2400	4800	9600
6	OFF	ON	OFF	ON
7	OFF	OFF	ON	ON

*Factory setting is 4800 bps.

7.2 Parallel Interface Type

Switch No.	Function	OFF	ON	Shipping Setting
1	Character	International		OFF
2	CR	CR disregarded	CR + LF	OFF



8. PRINT CONTROL FUNCTION

8.1 List of Control Codes

Symbol	Code (Hexadecimal)	Function
LF	0A	Line feed performed after printing.
CR	0D	Line feed performed after printing.
SI	0F	Standard letters assigned.
SO	0E	Laterally enlarged letters assigned.
US	1F	Standard letters assigned.
RS	1E	Laterally enlarged letters assigned.
CAN	18	Data cancelled.
DC2	12	Inverted prints assigned.
DC1	11	Initial setting.
ESC + "B"	1B/42	Continuous paper feed assigned.
ESC + "R"	1B/52	International characters to be set.
ESC + "/"	1B/2F	Sentences registered.
ESC + "!"	1B/21	Registered sentences printed.
ESC + "&"	1B/26	Individual patterns registered.
ESC + "%"	1B/25	Validity of registered letters.
ESC + "K"	1B/4B	Bit image printing.
FS + "W" + 1	1C/57/1	× 4 enlarged letters assigned.
FS + "W" + 0	1C/57/0	× 4 enlarged letters assigned.

8.2 Input Data Format

(1) Command for line feed after printing (CR / LF)
With CR (0DH)/ LF (0AH) codes input, data in the print buffer are printed. Without data in the print buffer, only line feed is performed. This command is disregarded when the buffer is full. CR can be disregarded with the DIP SW.

EX) 24-Column Model:
[Receiving data]

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0	CR	LF		
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0	CR	LF	CR	
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0	CR	LF	CR	LF

<Result of printing>

1 Dip Switch Setting at CR = CR+LF

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
S P A C E

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
S P A C E

S P A C E

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
S P A C E

S P A C E

S P A C E

Head stop position

2 Dip Switch Setting at CR = disregarded

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4
S P A C E

Head stop position

(2) SI / SO and US / RS Commands

SI / SO codes function in the same manner as US / RS as long as 8-bit data are assigned (serial communication data bit length), which, however, are divided, under 7-bit assignment, into SI (20H~7FH characters) print assignment and SO (A0H~FFH characters) print assignment functions.

1 Standard letter assignment (SI / US) command:

With SI (0FH)/ US (1FH) codes input, lateral enlargement is cancelled and the data following are printed in standard letters.

This command can cancel only lateral enlargement, which dose not apply to x 4 enlargement.

2 Laterally enlarged letter assignment (SO / RS) command:

With SO (0EH)/RS (1EH) codes input in any columns, the data following are printed in prints enlarged double in width. With line feeding or SI / SR code input, this command is cancelled.

Although standard and enlarged letters can be mixed within one line, automatic (buffer-full) printing takes place when the number of columns reaches 24 (or 40) counted in standard letters.

[Receiving Data]

S O	1 2 3 4 5 6 7 8 6 0	C R

S O	1 2 3	S I	A B C D	C R

S O	1 2 3	S I	A B C	S O	1 2	C R

A	S I	1 2 3 4 5 6 7 8 9 0 1 B

[Results of Printing]

1234567890
123ABCD
123ABC12 — Mixed printing
A12345678901B

Although the last letter has been assigned to lateral enlargement, it is printed in standard letter as it is in 24th columns. (For 40-column mechanism this applied to 40th columns.)

(3) Data Cancel (CAN) Command
With CAN (18H) code input, print data held within the line before input of the CAN code are all cancelled.

[Receiving Data]

S O	1 2 3 4 5 6	C A N	A B C	C R

[Results of Printing]
A B C *As data "1 2 3 4 5 6" are cancelled without the command "SO" cancelled, "ABC" is printed in lateral enlargement.

(4) Inverted Letter Assignment (DC2) Command
When data are input with DC2 (12H) attached at the beginning of a line (invalid when attached to any other place), data following are all printed in inverted letters.
To cancel this, input either DC2 again or DC1 (initial setting.)

(5) Initial Setting (DC1) Command
With DC1 (11H) input, various conditions set after power supply are cancelled and the state as at supply of power is restored.

(6) Continuous Paper Feed Assignment (ESC + "B" + n) Command
With ESC (1BH) + "B" (42H) + n code input, continuous paper feed at n-dot line is executed.
The n, however, should be a even dot line of $4 \leq n \leq 255$.
An odd number, if assigned to n, is regarded as an even number of "n-1".
If any scope other than the assignable scope has been assigned, this command is cancelled.
With this command input and printing data existing in a input buffer, printing is performed.
The printing line (10-dot line), however, is included in line feed volume "n". With $4 \leq n \leq 9$, inline space is made "0".

(7) International character setting (ESC + "R" + n)
By entering the code ESC (1BH) + "R" (52H) + n, characters input hereafter are set to the characters for the following countries.

n value and country setting

n	Country	n	Country
0	U.S.	5	Sweden
1	France	6	Italy
2	Germany	7	Spain
3	England	8	Japan
4	Denmark		

With n other than those specified, the set value for the U.S. is assigned.
NOTE)
On supply of power, with the dip switch, U.S. (n=0) are set.

(8) Sentence Registration (ESC + "/" + n) Command
With input of ESC (1BH) + "/" (2FH) + n + 'registered sentence' code, 24 (40)-bytes data following n are registered.
Set a numeral of 1~8 to n. With any other numeral having been set, data following are regarded as normal printing data, where no registration takes place and printing conducted.
When registration has already been made with the numeral set to n, the previous data are cancelled and the sentence newly set is registered.
Data cannot exceed one line which should be ended with CR (0DH) or LF (0AH).
To register sentences exceeding 24 (40) bytes, sentence up to 24 (40) bytes are registered, and the data following are printed out as printed data.
The ESC command cannot be registered.

(9) Registered Sentence Printing (ESC + "!" + n) Command

With ESC (1BH) + "!" (21H) + n code input, sentence already registered in the numeral assigned to n are printed.

NOTE 1)

As much as 24 (40) bytes of data can be registered. In case that 24 (40) columns are exceeded on printing (because of enlarged or x 4 letters having been assigned, etc.), printing is conducted up to 24(40)th column and the columns overflowed are printed in the next line. Be sure to make registration in consideration of printing results.

NOTE 2)

With x 4 enlargement or inverted letters executed at printing, printing continues in that setting unless they are cancelled.

Application Example 1

[Receiving Data]

ESC	/	This is a pen	CR

……. Sentence registered in 1.

ESC	/	Is this a pen ?	C R

……. No registration made with 9.

S O	/	It is a pen	C R

…….. Overwritten on sentence registered initially in 1.

S O	!	1

…….Printing of sentence registered in 1.

<Registered State>

1	It is a pen
2	
3	
4	
5	
6	
7	
8	

<Printing Result>

Is this a pen ? ←----Registration with 9 was invalid

It is a pen Immediately printed because not being within 1~8 scope.

Printed out with ESC + "!" + 1.

Application Example 2)
[Receiving Data]

ESC	/	1	This is a pen	CR

No.of columns has overflowed.

ESC	/	2	Japan CBM Corporation Micro	CR

ESC	/	4	SO	CITIZEN	SI	NEW PRODUCTS	CR

enlargement canceled

Is this a pen ?	CR

ESC	!	4

ESC	!	1

ESC	!	2

Impact dot printer	CR

<Registered State>

1	This is a pen			
2	Japan CBM Corporation Mi			
3				
4	SO	CITIZEN	SI	NEW PRODUCTS
5				
6				
7				
8				

<Printed Result>

cro
Is this a pen ? CITIZEN NEW PRODU CTS This is a pen Japan CBM Corporation Mi Impact dot printer

Directly printed out since overflow has occurred.

Application Example 3)
[Receiving Data]

ESC	/	1	FS	W	1	JAPAN CBM	CR

_____ Registered in 4 enlarged letters.

JAPAN CBM	CR

ESC	!	!

JAPAN CBM	CR

<Registered State>

1	FS	W	1	JAPAN CBM
2				
3				
4				
5				
6				
7				
8				

<Printed Result>

JAPAN CBM
JAPAN CBM _____
JAPAN CBM _____

Sentence registered in x 4 enlargement is printed.
Because x 4 enlargement assignment has not been cancelled, this sentence is printed still in x 4 enlargement to the request of printing without setting.

(10) Character registration (ESC + "&") command

1 For 24-column model (ESC + "&" + A1 + A2)

Individual patterns can be registered by entering the code ESC + & + A1 + A2, then entering the pattern data. A maximum of 8 characters can be registered, and any address in the range of 20H to FFH can be used for the registration. However, if a new pattern is registered in an address already in use, existing data is cleared and the newly entered data becomes valid. If more than 8 characters are registered, all existing character registration is cleared.

[Address setting]

Specified address is matched to the character code and can be accessed likewise to the stored fixed character record. If a fixed character is defined in the specified address, the fixed character becomes invalid.
A1 signifies the starting address for the registrations A2 is the ending address.

[Method of data transmission]

d-1 Single character registration

Select the address to be defied (character code) from among 20H to FFH and designate is as A1. When registering a single character, starting and ending addresses match each other. That is, A1=A2.

<Example>

A6 × 6 dot matrix full dot pattern is to be registered in address 41H (code for the fixed character "A"). (Numerals are hexadecimal.)

ESC + "&" + A1 + A2 + "Pattern data (6 byte)"

1B 26 41 41 FF • FF • FF • FF • FF • FF

In the successive controls, a 6 × 8 dot matrix full dot is output whenever the character code 41H is specified. (Character "A" cannot be accessed.)

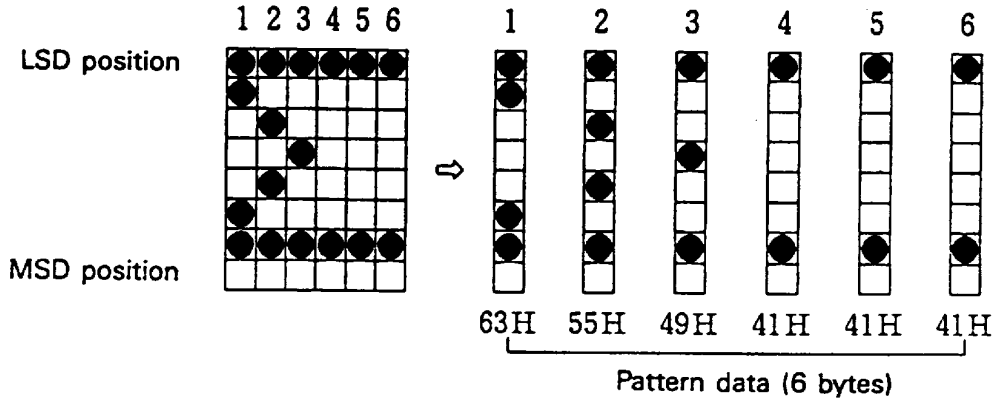
d-2 Multiple character registration

By repeating the single character registration, a maximum of 8 characters can be registered. When defining multiple characters in a successive address (character code), register pattern data for a maximum of 8 characters by designation A1 as the starting address and A2 as the ending address.

Note)

$A1<A2,\ A2 - A1 \leq 7$

[Pattern Data Configuration](For 24-Column Model)
Pattern data to be registered must consist of 6 bytes per character.
That is pattern data configured by a 6 × 8 dot matrix is broken up into 6 vertically positioned units each of which is represented by 1 byte of data. All together, 6 bytes of data are transmitted.
<Example> When transmitting the following data.



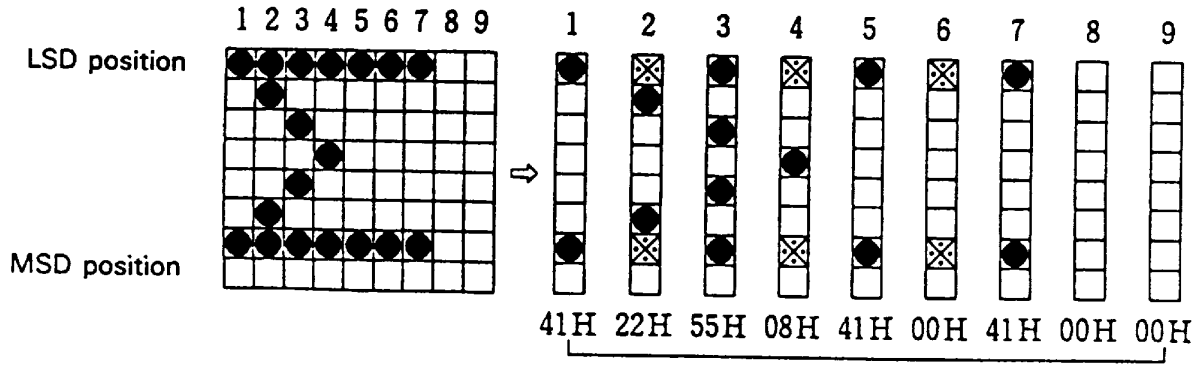
[Printing of Registered Letters]
To print registered character, in the same manner as printing other fixed characters, use the commands (CR, LF, ESC + "B" + n).

2 For 40-Column Model (ESC + "&" + C1 + A1 + A2)
With ESC (1BH) + "&" (26H) + C1 + A1 + A2 code and the pattern data following input, a pattern is registered.
Total 224 characters are available for registration into addresses of 20H ~ FFH.
When two pattern data have registered in the same address, those initially registered are cleared and the new data alone are made valid.

[Recognition of Use of Uppermost Bit]
For recognition of use or non-use of the uppermost bit by a character to be registered, set data to Parameter C1.
C1=0 (00H) : Uppermost bit not used.
Other than C1=0 : Uppermost bit used.
With 0 set to this parameter while the uppermost bit is in use, × 4 enlargement results in incomplete images for which the uppermost part is lacking.

[Setting of Addresses]
A1 : Registration starting address (20H~FFH)
A2 : Registration ending address (20H~FFH)

[Pattern Data Configuration](For 40-Column Model)
Pattern data to be registered must consist of 9 bytes per character. That is, pattern data configured by 9 × 8 dot matrix is broken up into 9 vertically each of which is represented by 1 byte of data.
All together, 9 bytes of data are transmitted.
<Example>
When transmitting the following pattern data :



Pattern data (9 bytes)

As the model utilizes the half-dot printing method. It is not capable of positing successive dots in the printing (lateral) direction. Therefore, pattern, even if assigned in the position "*" to the right of "●" in the diagram above, will not be registered as pattern data.

NOTE)
With 0 being set in "C1" parameter even if data have been registered in the uppermost position, letter image registered is made incomplete.

(11) Registered Letter Valid / Invalid (ESC + "%" + n) Command

Whether a registered pattern is valid or invalid is set with ESC (1BH) + "%" (26H) + n code being input.

n = 1 (01H) : Registered pattern to be made valid. (Addresses for which no registration change has been conducted are taken as inside fixed characters.)

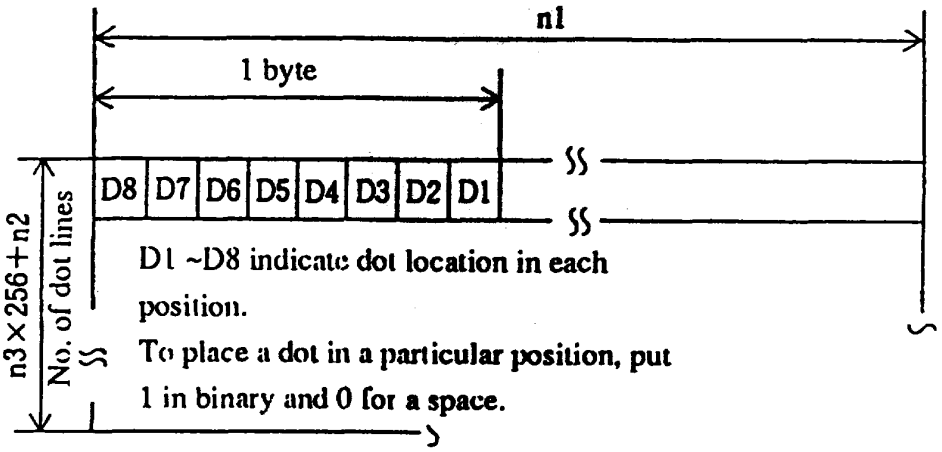
n = 0 (00H) : Registered pattern to be made invalid. (Taken as in side fixed character sets.)

The initial setting is 0 (inside fixed character).
Even with letters already registered by pattern registration, printing of registered letters cannot be effectuated unless the patterns registered are mode valid with this command.
NOTE)
This command is applicable only to the 40-column printer.

(12) Bit Image Printing (ESC + "K" + n1 + n2 + n3) Command

With ESC (1BH) + K (4BH) + n1 + n2 + n3 code being input, conversation from Text mode into Bit Image mode takes place. The n1/n2/n3 assigns amount of transmission of bit image data which follows these.
Where, n1 represents the no. of bytes in lateral direction and n2 (lowermost)/n31 (uppermost) represent the no. of dot lines vertical direction.

(Relations Between Data and Print-Out)


n1
1 byte
D8 D7 D6 D5 D4 D3 D2 D1
n3×256+n2
No. of dot lines
D1 ~D8 indicate dot location in each position.
To place a dot in a particular position, put 1 in binary and 0 for a space.

(Parameter Assignable Range)

Model	n1	n2	n3
24 columns	1~18	0~255	0~1
40 columns	1~23	0~255	0~1

In case that assignment has been made out of the assignable range or n2 = n3 = 0 has been assigned, Bit Image mode is cancelled and Text mode starts.
With this printer, on completion of read-in of 4-dot-line data or on completion of n1/ n2/n3 assigning data, lacking data are printed as spaces.
NOTE 1)
With n1 = 23 having been assigned in 40-column Model, 4 dots from the lowermost column (LSB) are made invalid. This is because the printing position in one line equals 180 dots.
NOTE 2)
On termination of bit image printing, Text mode is reinstated.

(13) × 4 Enlarged Letter Assignment (FS + "W" + 1) Command

With FS (1CH) + "W" (57H) + 1 (01H) code input, × 4 enlarged letters are assigned.
Data following this code are printed vertically and laterally twice enlarged.

(14) × 4 Enlargement Cancel (FS + "W" + 0)

With FS (1CH) + "W" (57H) + 0(00H) code being input, × 4 enlargement assignment is cancelled.
NOTE 1)
Although standard and laterally enlarged letters can coexist in one line, automatic (buffer-full) printing takes place on reaching to 24th (40th) column counted in standard characters.
NOTE 2)
With both × 4 enlargement and double-width having been assigned, × 4 enlargement has priority.

Application Example)
[Receiving Data]

1C	W	1	123456789	CR

1C	W	0	ABC	1C	W	1	123	CR

1C	W	0	A	1C	W	1	12345678901B

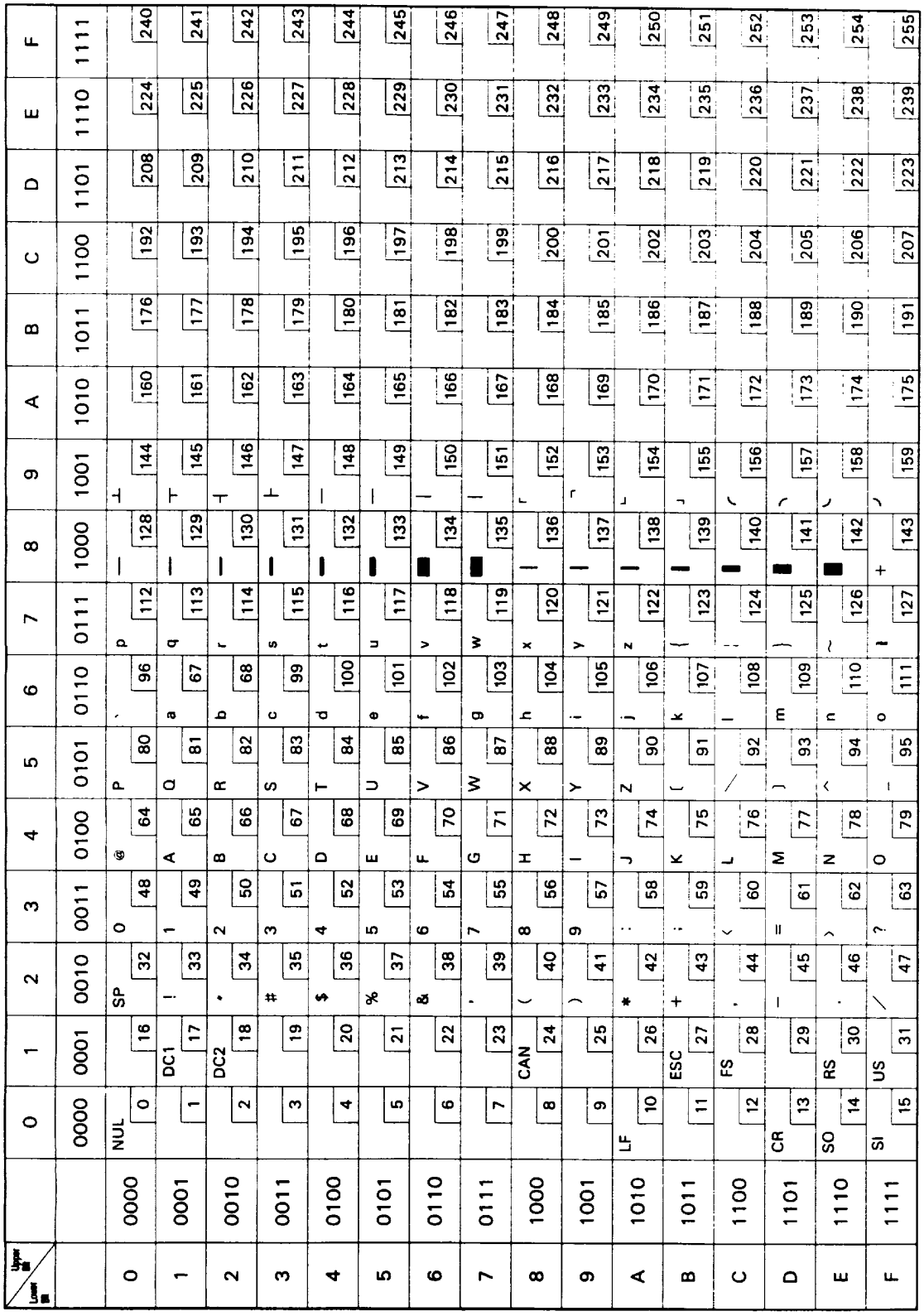
<Printing Results>

1 2 3 4 5 6 7 8 9
ABC 1 2 3
A 1 2 3 4 5 6 7 8 9 0 1 B

The last letter, although in × 4 assignment, is printed in standard letter since it being in the 24th column.
(For 40 column mechanism, this applies to the 40th column.)

9. CHARACTER SET

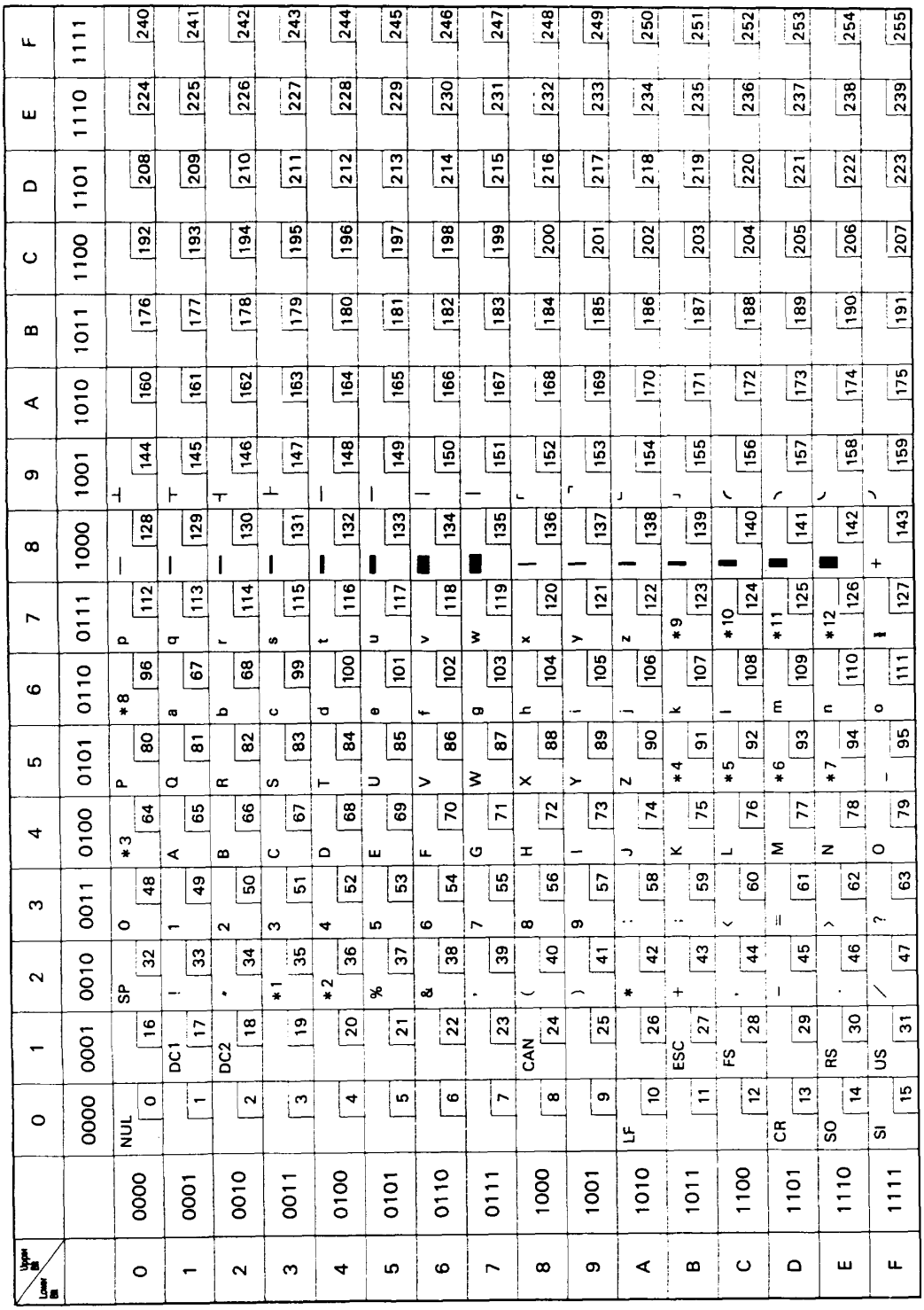
9.1 U.S.A. Specifications



Upper / Lower		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
		0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	NUL 0	16	SP 32	0 48	@ 64	P 80	` 96	p 112	— 128	┴ 144	160	176	192	208	224	240
1	0001	1	DC1 17	! 33	1 49	A 65	Q 81	a 67	q 113	— 129	┬ 145	161	177	193	209	225	241
2	0010	2	DC2 18	" 34	2 50	B 66	R 82	b 68	r 114	— 130	┤ 146	162	178	194	210	226	242
3	0011	3	19	# 35	3 51	C 67	S 83	c 99	s 115	— 131	├ 147	163	179	195	211	227	243
4	0100	4	20	$ 36	4 52	D 68	T 84	d 100	t 116	— 132	— 148	164	180	196	212	228	244
5	0101	5	21	% 37	5 53	E 69	U 85	e 101	u 117	— 133	— 149	165	181	197	213	229	245
6	0110	6	22	& 38	6 54	F 70	V 86	f 102	v 118	— 134	— 150	166	182	198	214	230	246
7	0111	7	23	' 39	7 55	G 71	W 87	g 103	w 119	— 135	— 151	167	183	199	215	231	247
8	1000	8	CAN 24	(40	8 56	H 72	X 88	h 104	x 120	— 136	┌ 152	168	184	200	216	232	248
9	1001	9	25	) 41	9 57	I 73	Y 89	i 105	y 121	— 137	┐ 153	169	185	201	217	233	249
A	1010	LF 10	26	* 42	: 58	J 74	Z 90	j 106	z 122	— 138	└ 154	170	186	202	218	234	250
B	1011	11	ESC 27	+ 43	; 59	K 75	[91	k 107	{ 123	— 139	┘ 155	171	187	203	219	235	251
C	1100	12	FS 28	, 44	< 60	L 76	\ 92	l 108	¦ 124	— 140	┌ 156	172	188	204	220	236	252
D	1101	CR 13	29	- 45	= 61	M 77	] 93	m 109	} 125	— 141	┐ 157	173	189	205	221	237	253
E	1110	SO 14	RS 30	. 46	> 62	N 78	^ 94	n 110	~ 126	— 142	└ 158	174	190	206	222	238	254
F	1111	SI 15	US 31	/ 47	? 63	O 79	_ 95	o 111	⌂ 127	+ 143	┘ 159	175	191	207	223	239	255

9.2 Character code Table

(*1 - *12 in the following code table are placed in the next page under ESC+R+n command.)

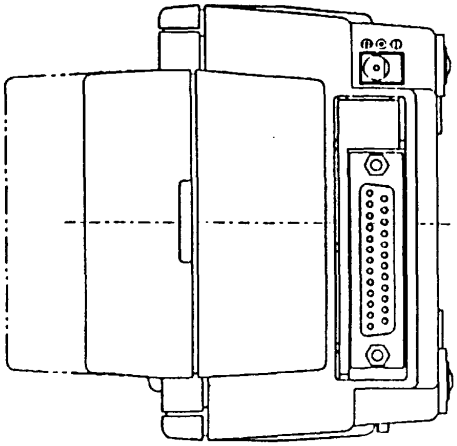


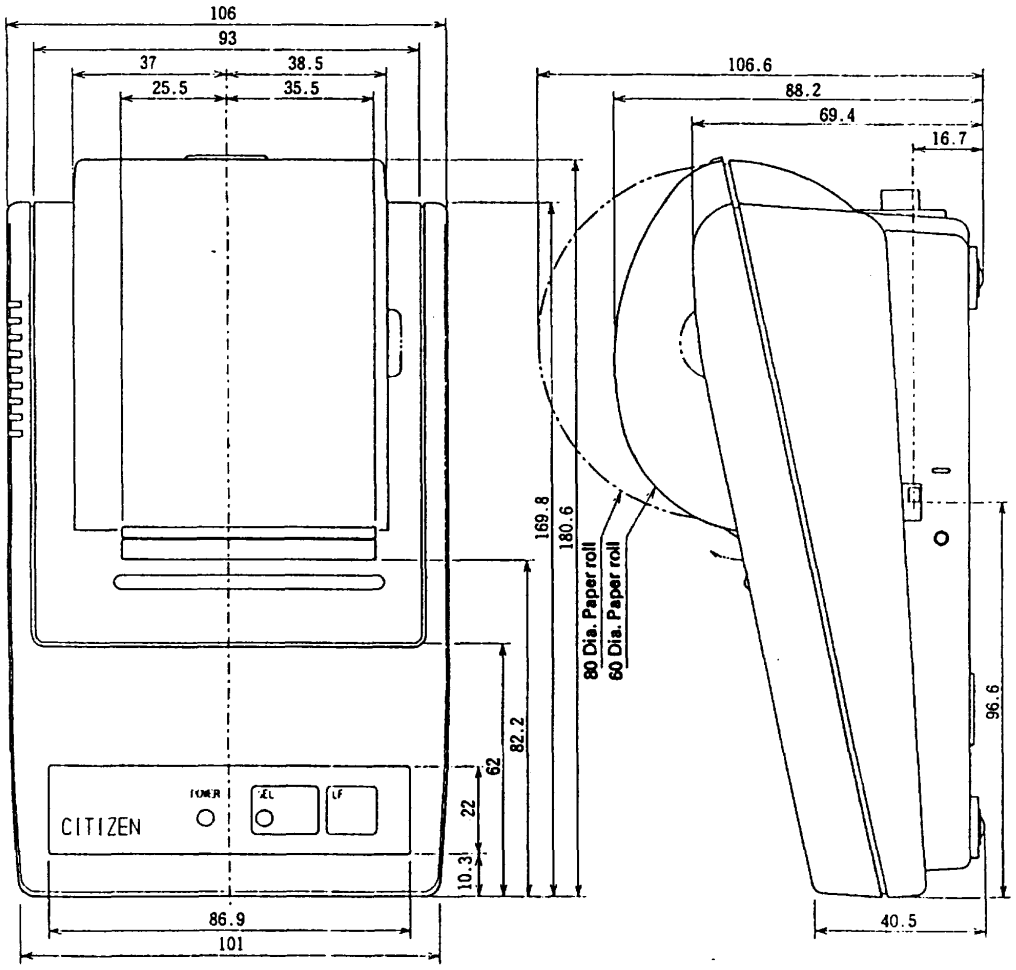
International Character Set

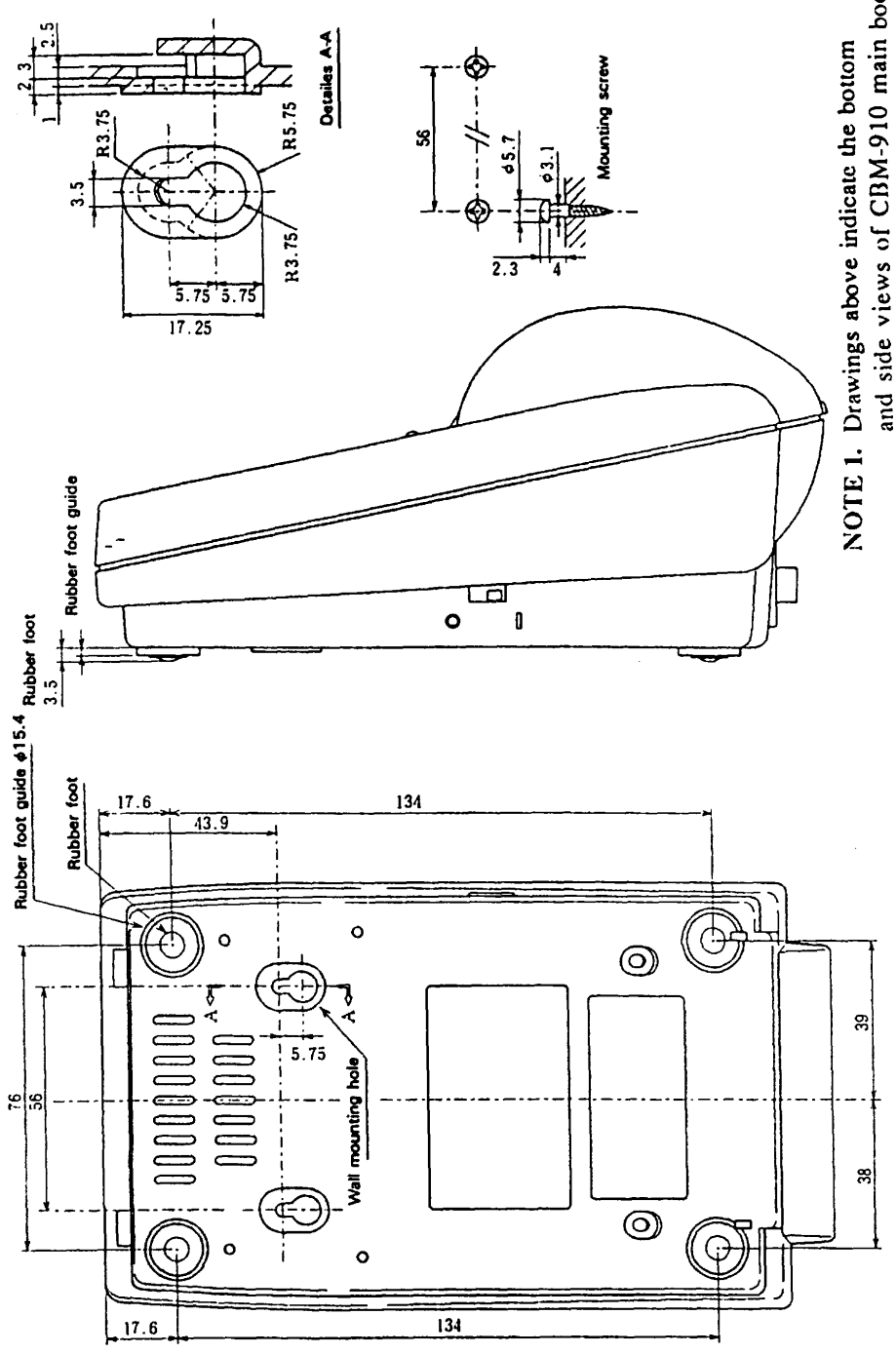
Character Codes

	CODE	U.S.A	France	Germany	U.K.	Denmark	Sweden	Italy	Spain
*1	23H	#	#	#	£	#	#	#	Pt
*2	24H	$	$	$	$	$	¤	$	$
*3	40H	@	à	§	@	@	É	@	@
*4	5BH	[	°	Ä	[	Æ	Ä	°	¡
*5	5CH	\	Ç	Ö	\	Ø	Ö	\	Ñ
*6	5DH	]	§	Ü	]	Å	Å	é	¿
*7	5EH	^	^	^	^	^	Ü	^	^
*8	60H	`	`	`	`	`	é	ù	`
*9	7BH	{	é	ä	{	æ	ä	à	¨
*10	7CH	¦	ù	ö	¦	ø	ö	ò	ñ
*11	7DH	}	è	ü	}	å	å	è	}
*12	7EH	~	¨	ß	~	~	ü	ì	~

10. EXTERNAL DIMENSIONS (in mm)







NOTE 1. Drawings above indicate the bottom and side views of CBM-910 main body.

NOTE 2. The wall hanging screw head shall be below 3 mm long.